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EPA's ORD INITIATIVES FOCUSSED ON CLEAN SEDIMENT

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Overview

- ▶ Role of Sedimentation in the ORD Ecological Research and Restoration Strategy
- ▶ NERL Ecological Research Strategy: Role of Clean Sediment
- ▶ NRML Initiatives in Sediment Management
- ▶ NHEERL Coastal and Inland Water Effects Research for Sedimentation Problems
- ▶ NCEA Restoration Effort
- ▶ NCERQA STAR Grants and RARE Program in Region 10



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DEVELOPMENT OF METHODS TO ASSESS SEDIMENT LOADING INTO SOUTHEASTERN PIEDMONT STREAMS

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Plenary Presentation, National Clean Sediment Workshop

Washington, DC, December 10, 1998



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Objectives

Methods to Manage Sediment Loads in Different Segments of Southeastern Piedmont Streams

Evaluate Draft TMDL Protocols for Sediment, Coliform Bacteria, and Nutrients

Intensive, High-Quality Data To Validate Methods (models and other techniques)

Information for Georgia and EPA Reg. 4 to set Total Maximum Daily Loads for Sediment

Extrapolation to Other Geomorphologic Provinces



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Why Study the South Fork of the Broad River?

- Typical of Sediment-Impacted Southeastern Piedmont Streams (Virginia to Alabama)
- State of Georgia and National Resource Conservation Service have Targeted the Stream for Action
- Region 4 is Intensively Investigating Bigger Creek Where Some Clear Cutting is Expected
- Convenient Location Near EPA and University of Georgia Facilities (ORD Near Laboratory Environmental Research Area)



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Measurements

- Stream Cross Sections Every 1/2 Mile (Bed Forms, Bars, and Other Features)
- Bank Pins, Surveys, Trenching, and Other Methods to Measure Bank Erosion
- Measure Weather Conditions (i.e., Rainfall, Temperature, Solar Radiation) at 4 to 5 Sites to Simulate Runoff, Sediment Yield, and Stream Flow
- Water Surface Elevations, Flow, Suspended Sediment, & Bed Load
 - Hourly
 - Three Stations in the Cross Section
 - Eleven Bridges, Cabled Sites, or Sites that can be Waded
 - During Every Rainstorm Projected >2 cm (Spring/Fall Frontal Movement)
- Measure Dissolved Oxygen, pH, Temperature, Specific Conductance, and Turbidity (Later Fecal Coliform, and Nutrients) and ISCO Grab Samples at a Point in the Cross Section
- Vertically Averaged Sediment Concentration (Pressure Transducers, UGA)
- Collect Data 2-5 Years Depending on the Results, Starting Spring 1999



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Model Documentation, Support, and Development for Sedimentation

- Hydrodynamic, Sediment, and Contaminant Transport Model (SED2D) Finite Difference Model on Center for Exposure Assessment Modeling Web Page (www.epa.gov/CEAM)
- SED3D Documentation Expected in Spring 1999
- Course Training Notes for HSPF on CEAM Web Page in Spring 1999
- Hotline Support for HSPF & Other Models (Waterways Experiment Station)
- Comprehensive Review of Water Quality and Sediment Transport Models to Document State of the Art (Aqua Terra using OW Report on Sediment Transport Models)
- Testing Sediment Mass Balance Simulations of Lumped Parameter (HSPF) and Distributed Watershed Models (CASC2D and MODELX) in the South Fork of the Broad River (Waterways Experiment Station)
- Develop New Generation of In-Channel Sediment Transport Algorithms -- First Step to Channel Geomorphology Model (Tetra Tech, Aqua Terra, Earl Hayter, NERL-Athens)
- Riparian Zone to Guide Evaluation of Best Management Practices



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Next Generation In-Channel Fate and Transport Models for Sedimentation

- Phase I (Tetra Tech and Aqua Terra, Expected June 1999)
 - 1D Box Model for Simplified TMDL In-Stream Sediment Balance Spread Sheet Model, and HSPF, WASP, and EXAMS
 - Advanced Cohesive and Noncohesive Erosion and Deposition, Bed Consolidation and Mobilization
 - Shear Stress for Bioengineering
 - Multiple Particle Sizes
 - Distributed Sources
 - Model Testing with Existing Data Sets
 - Documentation and Support
- Phase II (Hayter, Tetra Tech, Aqua Terra: Prelim. Version 1999)
 - 1D Model for In-Stream Processes to Upgrade HSPF and Distributed Watershed Models
 - Same Processes as Above but With Armoring and Finite Strain Consolidation of Bed



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Next Generation In-Channel Fate and Transport Models -- Continued

- Phase III (Expected in 2000)
 - Model Selection Hinges on Model Evaluation by Aqua Terra in 1999
 - 3D Sediment Fate and Transport Model for Difficult TMDLs in Lakes and Estuaries
 - Expect to Build on Models Being Developed by the EPA Office of Water (EFDM by Hamrick), NERL-Athens (SED3D), WES (CH3D-SED3D), NOAA (Blumberg-Mellor), and USGS (Woods-Hole and WRD, TRIM)
- Ultimate Goals
 - Stream Geomorphology and Riparian Zone Models Nested in Distributed Watershed Models for TMDL Analysis, Stream Bioengineering, and Stream Ecosystem Restoration
 - 3D Hydrodynamics and Multi particle Size Sediment Models Combined With Distributed Watershed Models to Link Ecological and Specific Biological Effects in Stratified Lakes and Estuaries to Land Use
 - Nested in Next Generation Multimedia Risk Assessment Systems (2008)



Environmental Sciences Division -- Las Vegas

- ▶ Sediment and Temperature TMDL Procedures for the Pacific Northwest (ID) Using Coarse Scale Modeling and Analysis Tools to Identify Sources and Effects (Iris Goodman)
- ▶ Sediment Sampling and Characterization (Brian Schumacher)



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Ecological Exposure Research Division Cincinnati, OH

- ▶ Development of Fish Biomarkers for Exposure to Excessive Sedimentation (Susan Cormier)
 - Investigating CDFs for blood gases (N₂), different enzymes in plasma and bile measured in impacted and unimpacted communities of fish
 - Established 20 reference stations with Ohio EPA
 - Conducting a synoptic, randomized design
 - Has been used for PAH & metabolites, & metals for EMAP



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National Risk Management Laboratory:

Initiatives in Sediment Management

- ▶ Primarily focusses on contaminated sediments, but significant advances are underway to improve hydrologic modeling in urban settings under the ORD Ecosystem Research Initiative. These models (i.e. SWMM) simulate sediment yields from various land uses and the transport of bulk sediment in static channels to relate exposure to best management practices in some cases.
- ▶ Mulkey.Lee@epa.gov is the Associate Director of NRML who has a lead in developing the ORD and NRML Strategies for Ecosystem Restoration



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National Health and Environmental Effects Research Laboratory

- ▶ Coastal Sedimentation Effects on Coral Reefs (Gulf Ecology Division)
- ▶ Sediment Effects on Habitat (Atlantic Ecology Division)
- ▶ Embedded Sediment Effects in Freshwater (Mid-continent Ecology Division)
- ▶ Land Use Effects on Sedimentation in Estuaries and Streams (Western Ecology Division)



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National Center for Environmental Assessment

- ▶ Reports One Project Being Completed on Contaminated Sediments
- ▶ Norton.Susan@epa.gov is the PI



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National Center for Environmental Research and Quality Assurance

- ▶ See http://es.epa.gov/ncerqa_abstracts for sediment related grants underway or completed in the last two years (26 out of 226 related to clean sediment research)
- ▶ University Grants and Center Research (HSRC etc.)
- ▶ Water and Watersheds Program with NSF and now USDA
- ▶ This program is where the Agency Invests in Longer-term and Critical Outside Development (SBA)